

FUELS

What are they?

Substances which are **used on a large scale to transfer energy** to the surroundings.



Ideal fuels

An ideal fuel should...

- release large amounts of energy
- not require too much oxygen
- ignite easily and keep burning without extra help
- be readily available in large quantities
- be reasonably priced
- give clean, non-polluting products which can be easily disposed of
- be convenient to store and safe to transport

Energy

- chemists quote energy released in kJ mol^{-1}
- industrially, it is usually quoted in kJ kg^{-1}
- what appears good on one scale doesn't on the other ... *complete the table*

<i>Fuel</i>	<i>Formula</i>	<i>M_r</i>	<i>Energy per mole kJ mol⁻¹</i>	<i>Energy per kilo kJ kg⁻¹</i>
Hydrogen	H ₂ (g)	2	-286	-143000
Carbon	C(s)		-393	
Methane	CH ₄ (g)		-890	
Methanol	CH ₃ OH(l)		-715	
Octane	C ₈ H ₁₈ (l)		-5512	

Oxygen

Fuels which require a lot of oxygen for complete combustion run the risk of producing poisonous carbon monoxide.

Q.1 Write equations showing the **complete** combustion of the fuels in the table. Which requires the most oxygen?

Hydrogen:

Carbon:

Methane:

Methanol:

Octane:

Ignition

- **gases or volatile liquids** are usually **easy** to ignite - they **mix easily** with air/oxygen
- **solid** fuels may have to be **ground to a powder** for a **greater surface area**

Availability and price

Supply and demand have a great affect on the economics of energy production.

Availability is affected by

- ease of extraction
- area of origin
- wars
- political policy - strategic and economic

Price depends on

- exploration
- extraction
- refining
- transportation
- overheads (salaries, advertising, building)
- tax
- demand (price goes up when demand is greater)

Products

- hydrocarbon fuels produce carbon dioxide (greenhouse gas) and water
- if combustion is incomplete, carbon monoxide is produced
- fossil fuels contain sulphur - SO₂ leads to acid rain
- coal produces an ash waste
- hydrogen only produces water

Storage

- storage is often unsightly - *gas holders, oil tanks, coal bunkers*
- gases need to be stored in safe containers - often under pressure (*safety*)

Transport

- **solids** must be transported by road or rail
- extra traffic and environmental pollution via road but flexible delivery
- rail can deliver straight to power stations but is less flexible for local supply
- **liquids and gases** can go via **pipelines** - *expensive to construct*
- sending **gases by road is expensive** as the mass delivered is small
- delivery of crude oil by supertankers runs the risk of marine pollution

Q.2

The degree with which the modern world relies on the three main fossil fuels as sources of energy is a major cause of concern.

- *What is the difference between a renewable and a non-renewable source of energy?*
- *Outline the alternatives to fossil fuels, stating their advantages and disadvantages.*
- *What are biofuels?*
- *What are your views on using nuclear power to generate electricity?*